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NAMA crediting: How to assess offsets from and additionality of policy-based mitigation actions in developing countries

Yuri Okubo[1 *], Daisuke Hayashi[2] and Axel Michaelowa[3]

[1] myclimate, Sternenstrasse 12, 8002 Zurich, Switzerland

[2] Perspectives GmbH, Klosbachstrasse 2, 8032 Zurich, Switzerland

[3] Center of Comparative and International Studies, Institute of Political Science, University of Zurich, Affolternstrasse 56, 8050 Zurich, Switzerland

Abstract: Climate policies in developing countries – called NAMAs in the negotiation jargon – are likely to generate greenhouse gas emissions credits after 2013. To guarantee credibility of the international climate policy regime, robust measurement, reporting and verification procedures are required. Compared to concrete emission reduction projects, assessment of the additionality of NAMAs is difficult. As only a subset of policy options leads to directly quantifiable emission reductions, the challenge is to define procedures that are conservative and still provide incentives to embark on policies with long-term and indirect effects. This requires a combination of an approach using default parameters and monitoring of key factors. Experience from methodologies used under the Clean Development Mechanism should be taken into account. Analysis of a renewable energy feed-in tariff in Korea and a nationwide demand-side management program in Thailand shows that for the former, additionality and emission impacts of policies can be assessed, but require centralized, transparent data collection systems, an effective sector organization. The latter is probably not suitable for NAMA crediting under a stringent approach. If one wants to allow a greater number of developing countries to benefit from NAMA credits, more standardized approaches would be required to allow covering policies that are more difficult to quantify.

Keywords: NAMA, carbon finance, climate policy, mitigation, MRV, baseline, additionality, developing countries

* Corresponding author: yuri.okubo@myclimate.org

1. Introduction

The Bali Action Plan under the United Nations Framework Convention on Climate Change (UNFCCC), which was agreed upon at the 13th Conference of the Parties (COP13) in 2007, mapped the path for a new negotiation process for the post 2012 international climate policy framework. Its key breakthrough was the acceptance of "nationally appropriate mitigation actions (NAMAs) by developing country Parties in the context of sustainable development, supported and enabled by technology, financing and capacity-building, in a measurable, reportable and verifiable manner" (decision 1/CP13). The Copenhagen Accord signed by a large number of important industrialized and developing country in early 2010, but not agreed at the level of the UNFCCC Conference of the Parties, sees an important role for NAMAs.

NAMAs may include any actions suggested by developing country governments, but can be classified in three general classes depending on the source of funding for the implementation:

- Unilateral NAMA: Financed and implemented domestically.
- Supported NAMA: Receive international financial and/or technical support.
- Credited NAMA: Generate offset credits that can be sold on the carbon market.[1]

Depending on the type of NAMA, measurement, reporting and verification (MRV) of NAMAs

[1] The EU and the US have proposed sectoral crediting mechanisms whose design has thoroughly been discussed in the literature, see e.g. Aasrud et al. (2009) and Bosi and Ellis (2005). We will therefore not assess sectoral mechanisms in this paper.

would have to take different forms. In general, credited NAMAs should be subject to the most stringent MRV in order to ensure the integrity of the carbon market. Stringency of MRV is likely to be lower for supported and unilateral NAMAs. In fact, the Copenhagen Accord envisages international MRV for supported NAMAs, while unilateral NAMAs would only require domestic MRV. Negotiations in 2010 have struggled regarding this issue, with industrialized countries led by the US arguing for strict, international MRV, and developing countries led by China opposing it.

The key question which policy-based mitigation actions could be eligible for NAMA crediting has not yet been defined by the international negotiations and is the focus of this article. Given that policymakers decided in 2005 that policies should not be able to generate credits under the Clean Development Mechanism (CDM), it is imperative to define robust procedures for NAMA crediting in order to prevent a political backlash. How should a NAMA crediting mechanism be designed, especially with regard to requirements for MRV as well as additionality demonstration of NAMAs, the key fundamentals of offset mechanisms? Which policies would be amenable to NAMA crediting? Section 2 introduces key elements of MRV and additionality demonstration and draws general lessons for NAMA crediting. Section 3 analyzes feasibility of NAMA crediting based on two policy cases, a feed-in tariff (FIT) and an appliance efficiency standard. Finally, section 4 concludes with a summary of key issues relating to the design of NAMA crediting.

2. MRV and additionality of offset mechanisms

The Bali Action Plan does not define "measureable, reportable and verifiable". This chapter explains key elements of MRV and additionality demonstration and draw some general lessons for NAMA crediting.

2.1 Measurement

The function of measurement is to describe a phenomenon in reasonably precise, objective terms in terms of an established standard or "unit of measurement" (Breidenich and Bodansky, 2009). The process for carrying out measurement of NAMAs could vary depending on how NAMA crediting is designed. In general, however, the key questions relating to the measurement requirements are: (i) in which metric should emission reductions be measured, and (ii) what kind of guidelines needs to be followed (Ellis and Moarif, 2009).

As to the first question, there could be different ways of assessing GHG mitigation actions, i.e. qualitatively or quantitatively. Assessment could be in terms of the qualitative or quantitative input to such actions (e.g. funding, establishment of energy efficiency regulations), intermediate output (e.g. numbers of energy efficient appliances installed) and/or the GHG outcome of such actions (Vine and Sathaye, 1999). When it comes to NAMA crediting, however, the answer to this question is straightforward – crediting works only if the impact of a NAMA is measured quantitatively in terms of GHG emission reductions. Mitigation actions that can easily establish a clear causality between the action and the GHG outcome are more likely to qualify for NAMA crediting. On the other hand, the quantification of GHG outcome is particularly difficult for mitigation actions that affect a large number of actors (e.g. measures that affect the demand for road transport), where impacts may be indirect and/or occur after a considerable time-lag (e.g. R&D), and/or where feedback or effects from other sources can be important (e.g. energy efficiency measures) (Loreti et al., 2001). Consequently, this fundamental requirement of quantification of GHG outcome defines a natural niche of NAMA crediting.

With regard to the second question, the single most important issue in development of guidelines is accuracy in the estimation of emission reductions achieved by NAMAs. There is already a large body of material relating to how to measure emissions from different sources and sectors – at the project, organization or national level (e.g. IPCC, 2006, WBCSD and WRI, 2001, ISO, 2006a-c). On the other hand, there is much less guidance on how to measure emission reductions, which requires both measurement of emission levels and determination of the baseline. While some observers argue that baselines for emissions reduction are counterfactuals that can never be proven and thus should be replaced by negotiated emissions levels, the negotiations themselves show a consensus to embark on monitoring, which requires a measurable baseline. Furthermore,

more and more guidance on how to quantify the GHG impact of different actions at the program and project level has become available (e.g. CDM methodologies, national program evaluation). The application of CDM methodologies has shown that data availability in a host country can be a major bottleneck. Therefore, it is important to strike a balance between accuracy and usability of measurement guidance.

2.2 Reporting

The purpose of reporting is to permit others to assess what a country is doing, on an absolute basis and/or relative to others. In general, there are two key determinants of successful reporting: (i) the precision and reliability of the reported information, and (ii) the degree to which information is presented in a transparent and standardized way that allows comparison between reports and verification by others (Breidenich and Bodansky, 2009).

The former point relates to the issue of measurement. As to the latter, there are a number of issues related to modalities of reporting such as common reporting format and guidelines, outlining how mitigation actions are reported (e.g. WBCSD and WRI, 2001). More uniform reporting standards could make verification results more widely understood and accepted (Loreti et al., 2001).

2.3 Verification

Verification generally refers to the process of independently checking the accuracy and reliability of reported information or the procedures used to generate information (Breidenich and Bodansky, 2009). In the context of verification of NAMA crediting, the following questions would be most important: (i) who should serve as verification body, and (ii) what needs to be verified, and how.

As to the first point, if NAMAs were to generate carbon credits, independent verification of their emission reductions would likely be required. It is obvious that credited NAMAs would be treated at least as stringently as supported ones. Policymakers should note the experiences with verification under the CDM, where a lack of trained auditors has resulted in a significant bottleneck of projects at the validation and verification stages (Ellis and Moarif, 2009). Due to a broader coverage of policy-based mitigation actions, NAMAs would require much more auditors for verification, especially with host-country-specific experience. The capacity building requires significant resources and preparatory time.

Deciding what needs to be verified could be equally contentious (Ellis and Larsen, 2008). If each country was allowed to determine the scope of verification, the quality of NAMA credits from different countries would never be comparable to each other. Such a differentiated approach would result in a number of fragmented market segments for NAMA credits with little fungibility. Consequently, it would most likely result in a very inefficient market, increasing transaction costs as well as mitigation costs compared to a global solution. Therefore, common international standards for verification are essential for the carbon market to function properly and mobilize the emission reduction potential in developing countries in a sufficient scale. Only if there is no agreement on a global scale, differentiated standards would be a second best.

2.4 Additionality

The CDM has collected significant experience with additionality demonstration of its projects (Michaelowa, 2009). Therefore, it is beneficial to consider whether the current CDM additionality rules could be applied to NAMA crediting and what problems might occur. A CDM project is considered to be additional if anthropogenic emissions of GHGs by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (UNFCCC, 2001). A multi-stage tool has been defined that requires an investment or a barrier analysis as a first step of additionality check, followed by a common practice analysis:

- **Investment analysis** checks whether the proposed project is economically or financially less attractive than at least one other alternative.
- **Barrier analysis** checks the existence of barriers that would prevent the proposed project if it were not for the CDM. This may include financial, technical and policy barriers.
- **Common practice analysis** needs an assessment to what extent the proposed

technology or practice has already been deployed in the relevant sector and region.

If applied to NAMA crediting, the investment analysis may be difficult to implement because the compliance costs for the introduced policy would frequently be borne by the private sector and it is unclear to what extent the policy will actually mobilize emissions reductions. Policies passing the additionality test likely require a strong enforcement by the government. The barrier and common practice analyses may become problematic for some cases since the proposed policy is likely to pursue other objectives than GHG emissions mitigation and can be introduced for a variety of reasons, such as reduction of air pollutions, technology promotion and energy-saving. One way to differentiate this would be to use an approach similar to the incremental cost calculation of the Global Environment Facility (GEF) (Michaelowa, 2005). How and whether to take these benefits into account in additionality assessment remain an open question. Technology barriers could be demonstrated if, for example, the technology required for meeting the standard does not yet exist in the country and only with the credits from the NAMA becomes it possible to promote this technology. Political barriers will differ and may need to be analyzed policy by policy at a country-specific level.

Additionality also depends on the length of the crediting period. Consider a policy subsidizing renewable energy. Due to technical progress, after a decade the renewable energy technology no longer needs subsidies. Thus the policy ceases to be additional at that point in time. Similarly, an efficiency standard that may be stringent at the time of introduction is likely to become common business practice over time unless regularly updated.. This challenge can be addressed by monitoring the development of technology over time in a similar country not having a supportive policy, and stopping the crediting period at that point in time. It would also be possible to limit the crediting period to the end of the subsequent commitment period of the international climate regime, and to require a resubmission and new validation of the policy for a new crediting period.

3. Evaluation of NAMA crediting

The quantifiability of emission reduction impacts of policies, hence feasibility of crediting, greatly differs by policy type. The IPCC 4th assessment report defined eight categories of mitigation policies as shown in Figure 1 (IPCC, 2007). In general, policies whose mitigation impacts are quantifiable are amenable to an offset mechanism because MRV of such policies can be output-based (e.g., in t CO_2 eq./year). If there is political agreement to credit also policies whose impacts are not readily quantifiable in an emission reduction term, MRV would have to be based on an input-based metric (e.g., amount of money spent on R&D).

[Insert Figure 1 here]

From the above eight categories, the following two categories are chosen for a detailed analysis: (i) appliance efficiency standard in Thailand (regulation and standards), and (ii) a FIT in Korea (subsidies and incentives). These are early, widely renowned policies with good outcomes and thus are good cases for policies that become increasingly replicated across developing countries (see IEA 2010 a,b). Also, these are policy categories whose GHG impacts are relatively easy to evaluate. We chose advanced developing countries because the origin of the NAMA concept targeted this type of countries. Hence, the analysis of these policies gives a first indication of the feasibility of NAMA crediting under favorable circumstances.

3.1 Feed-in tariff – the case of Korea

A FIT is a policy to incentivize the installation of renewable energy through government subsidies. The government will require regional or national electricity utilities to buy electricity from renewable energy at above-market rates. Usually, a FIT will be lowered over time according to the cost reduction achieved by technology diffusion and development. The success of this policy has been proved in many countries and regions around the world. Among Non-Annex I countries, 18 countries had adopted this policy by 2009 (REN21, 2009).

In Korea, the government set a target for penetration of new and renewable energy as 5% of its primary energy supply in 2011 (IEA, 2007). The FIT was introduced as the main policy tool to achieve this target. The government guarantees fixed rates for five years for small hydropower, biomass and waste generation, and for 15 years for wind and photovoltaic (PV). In the Korean FIT, PV receives a special treatment as it benefits from a tariff more than six times higher than the rate paid for wind (see Table 1). In general, differentiation of feed-in tariffs shall allow technologies at different stages of cost and development to attain a critical mass and sufficient market penetration to become economically viable (IEA, 2007).

[Insert Table 1 here]

3.1.1 Measurability

Data required for quantifying GHG emission reductions from renewable energies are electricity generation from the newly installed capacity, a baseline grid emissions factor, and indirect emissions from renewable energy operation. In the Korean case, the new installed capacity data is available on the Korea Energy Economics Institute (KEEI) website on an aggregate level. Baseline grid emissions factor data is readily available in the Statistics of Electric Power published by the Korea Electric Power Corporation (KEPCO), which represents the grid system of all over the country (KEPCO, 2008).

However, the difficulty in the measurement of policy effects is that a FIT is often not the only policy for promoting renewable energy. Except for Costa Rica and Sri Lanka, all developing countries that introduced a FIT have introduced additional policies, such as capital subsidies, grants, or rebates (REN21, 2007). Therefore, even if GHG emission reductions are quantifiable, these may not have been driven by the FIT alone.

In the Korean case, analyzing the array of policies supporting renewable energy in detail, many of the policy effects can actually be differentiated from the FIT. The policy portfolio includes tax audit exemption for renewable energy producers, subsidies for demonstration projects, and subsidies for renewable energy implementation in buildings (IEA 2010a). The FIT seems to have played a key role in increasing the PV installation since the share of grid-connected PV systems has increased enormously since 2004. On the other hand, the share of off-grid PV systems continued to decrease, and there was nearly no further installation of off-grid PV systems since 2007 (Yoon and Kim, 2009). This clearly shows that off-grid PV were not attractive and thus without the FIT on-grid systems would not have been installed.

Even if differentiation of GHG impacts of the policies is possible, other external influences (e.g. fuel price increase) may as well influence the GHG emission levels. It might be practically impossible or not cost-effective to weed out all these external influences on the emission reductions. Therefore, if a crediting system were to be established some kind of adjustment of the emission reductions (e.g. discounting) need to be considered.

3.1.2 Reportability and Verifiability

For verification, the crucial point is to assess the data collection and evaluation process is transparent and retraceable. In Korea, the Ministry of Knowledge Economy (MKE) is responsible for energy policy and various support mechanisms including the FIT. There are three major government-affiliated institutions that manage energy data and support ministries with analysis and development of policy measures: Korea Energy Management Corporation; Korea Institute of Energy Research and KEEI. In addition, the government appointed Korea University as an organization for planning and managing PV R&D programs and established the Korea Photovoltaic Development Organization. For PV the University of Korea publishes an annual report for the IEA which include some evaluation of the policies to promote PV in Korea. Companies that report the data would need to submit more detailed information (e.g. auxiliary fuel consumption). Considering the capacity of the institutions and the current data availability, it is likely that Korea has sufficient capacity to comply with the necessary verification needs.

3.1.3 Additionality

The FIT could undergo an investment test by calculating the difference between the FIT and the retail electricity price as well as the difference between the typical levelized electricity cost of renewable energy and that of fossil energy. As long as both parameters show a positive value, the investment test would be passed. In the Korean case, unit cost of PV power generation is always higher than the other types of power, but that is not always true for wind (see Table 2). Therefore, additionality of PV can be justified at the policy level in Korea whereas for wind, plant level assessment or the timing as to when fossil fuel power plant will be more/less expensive than the unit cost of wind power would need to be identified. Even in other countries, the unit cost of renewable electricity would be much higher than that of electricity generation using fossil fuels such as coal, and liquefied natural gas (LNG) etc.

Regarding the barrier test, renewable energy usually requires high capital investments and it is impossible to recoup the investment at market rates paid for electricity. A FIT would overcome these barriers by increasing revenues, but also faces barriers in raising public funds. In Korea, it is planned that a Renewable Portfolio Standard (RPS) will replace the existing FIT scheme from the year 2012 mainly because of the shortfall of the public funds that have been available for the FIT system. This implies that if NAMA crediting is established and if the cost of PV and wind is still higher than the others, then Korea can prove the additionality of their FIT since they were planning to shift to RPS owing to the lack of funding.

[Insert Table 2 here]

The problem of the FIT is that its additionality may cease once the supported technology becomes economically viable. To address this problem, the investment analysis described above would have to be regularly repeated. Alternatively, a technology penetration analysis for a country with a similar development level but without a FIT could be adopted. A technology penetration threshold will be predefined and credits gradually discounted when the threshold is passed. For instance, if renewable energy exceeds e.g. 10% of the total primary energy consumption in the country which is used for comparison, credits from the FIT would start to be discounted.

3.1.4 Suitability of FIT for NAMA crediting

Overall, a FIT seems to be highly suitable for NAMA crediting. A baseline emissions factor can be calculated, the overall production level of renewable energy after introduction of the FIT can be monitored and additionality of the FIT assessed using both an investment and a barrier test. The crediting period of the FIT would stop once the investment test cannot show any more that the development of renewable energy requires continued subsidization.

3.2 Appliance efficiency standard - the case of Thailand

Energy efficiency standards can be applied for many types of equipment, such as household appliances, buildings and vehicles. Different incentives (e.g. labeling and subsidies) can be provided to support them. The more “traceable” the emission reductions of a measure are, the more likely that they can be credited (Figueres and Philips, 2007). In the CDM, an attempt failed to credit emission reductions through the implementation of efficiency standards for air conditioners (ACs) in Ghana. One of the main reasons for rejection was that the emission reductions could not clearly be attributed to the proposed measures since efficiency of appliances was also affected by many other factors. The measures included efficiency information labels, setup of a testing lab, training of relevant stakeholders, and incentive schemes. Therefore, to make the energy efficiency standards credible, the emission reduction should be reasonably attributable to these project activities.

In the following, a household appliance standard in Thailand is analyzed. Thailand is the first country in Asia that adopted a nationwide demand-side management (DSM) approach in the 1990s. The Electricity Generating Authority of Thailand (EGAT) in 1993 launched a DSM program with a budget size of USD 189 million to run from 1994 to 1998 (Thailand Office of Environmental Policy and Planning, 2002). In the starting phase of the program, EGAT addressed fluorescent tube lamps (FTL), refrigerators and ACs (see Table 3). For all these equipments EGAT approached the manufacturers directly and encouraged them to produce energy efficient equipments while covering the cost of public campaigns to educate the public about the benefits of energy-saving equipment. For the FTLs and refrigerators, this approach worked relatively well as there were only five manufacturers each and the incremental cost was limited. Within a year, all manufacturers had completely switched their production to efficient FTL and 60% of refrigerators sold in 2000 met the best standard of the program. On the other hand, the effectiveness of the AC program had been less than anticipated. There were more than 55 AC manufacturers, many of which were small and the incremental cost had been too high for them to bear (UNDP and ESMAP, 2000). Only 40% of the ACs sold in 2000 reached the best category.

[Insert Table 3 here]

3.2.1 Measurability

The calculation of emission reductions from an energy-efficiency policy for electric appliances at least requires the following datasets:

1. Energy performance and number of energy-efficient appliances sold,
2. Operating hours of both efficient and replaced appliances,
3. Number and energy performance and disposal of the replaced models,
4. Carbon intensity of the electricity grid in the region/country where energy-efficient appliances were sold.

In general, the first dataset is difficult to obtain in those developing countries that have inadequate or unreliable retail data and large informal retail sectors. The second and third data items needs detailed surveys but are necessary to estimate the baseline emissions and to minimize leakage emissions. The impact of appliance labeling programs would be easier to quantify if they have financial incentive programs that facilitate the tracking of energy-efficient appliance penetration in the marketplace accompanied by strong monitoring. If there are no such incentives the impact must be traced through retailer surveys and consumer surveys, which would result in a high degree of uncertainty because of the difficulty in tracking retail purchases and sales in most developing countries (Figueres and Philips, 2007).

In order to understand the progress and results of specific energy-efficiency projects, monitoring guidelines are needed for these programs. Besides lessons learned in the context of energy-efficiency projects in the CDM (Michaelowa et al. 2009), a number of monitoring guidelines has been developed for voluntary GHG reduction programs (e.g. WBCSD and WRI, 2001). Moreover, there is a widely accepted set of procedures for measuring energy savings in the form of the International Protocol for Measurement and Verification Procedures (IPMVP). A key challenge is that the dispersed nature of energy-efficiency measures will require robust sampling techniques to capture leakage, free riders and eventual rebound effects. However, direct measurement and verification of emission reductions has been seen as prohibitively expensive (Michaelowa et al. 2009). In the CDM context, for energy-efficient lighting projects, project developers can choose between the direct monitoring approach and an approach that enables the greater use of default factors (deemed savings approach). However, the deemed savings approach requires special care when performance characteristics and use conditions of a measure are not well known or consistent (NAPEE, 2007). For more complex types of appliances, a higher degree of direct measurement would be required. A compromise might be to use the deemed savings approach together with some monitoring of one or two key parameters. For instance, in a high-efficiency motor program, actual operating hours could be monitored over a full work cycle (NAPEE, 2007). Such combination of the deemed savings and MRV concepts could increase practicability of the emission reduction calculation while maintaining the necessary degree of the environmental integrity. In order to strike a balance between accuracy in emission reduction calculation and practicability of the calculation procedures, it is important to elaborate what parameters can be deemed and what not for specific project types (Michaelowa et al., 2009).

In Thailand, it was relatively easy to determine the first dataset because of the limited number of manufacturers and importers of FTL and refrigerators. The number and energy performance was tracked based on the distributed labels by DSM office. For the second and third datasets, surveys were conducted to determine operating hours for lighting and appliance disposal: participating/non-participating residential customer surveys; participating/non-participating non-residential customer surveys; interviews with lighting/appliance manufacturers and importers; interviews with EGAT DSM Office and Systems Planning Department personnel, and sample end-use metering (UNDP and ESMAP, 2000). It is not clear how the rebound effect was considered. Regarding leakage, as none of the programs except for the AC program offered financial incentives for manufacturers, it can be argued that there were no free riders for lamps and refrigerators. Based on the survey, the free riders of the AC program were estimated at 14% of those that participated in the interest-free loan initiatives. These were then accounted for in the baseline projections (UNDP and ESMAP, 2000).

One lesson learned from the existing energy-efficiency projects under the CDM is that, in order to evaluate the emission reduction impact of a labeling program, there needs to be a clear link established between (i) the implementation of the labeling scheme and the manufacturing of the efficient appliances triggered by the labeling scheme, as well as (ii) the manufacturing of the efficient appliances and their use. A relevant degree of causality needs to be proven for the emission reductions of the policy to be credited. The analysis conducted in Thailand is mainly on the second level of linkage, but it also needs to be proved that the labeling and not anything else did make the manufacturers produce the efficient equipment.

In the Thai case, World Bank (2006) reported that, using multiple lines of evidence, it was possible to assess the contribution of the DSM program to various changes in the relevant markets. The evidence they consider as valid was the significant efforts of the DSM Office for promoting tested and labeled units, direct negotiation with manufacturers to produce the best energy efficient level product, and good historical data of equipment sales (World Bank, 2006; Tanatvanit et al., 2004). However, it is still difficult to prove a direct causality for the AC component, because unlike for FTL and refrigerators, the labeling of AC did not become mandatory.

4.2.2 Reporting and Verification

The evaluation of the first five-year DSM program in Thailand was done by the EGAT DSM Office and appointed consultants as well as by an Independent Monitoring and Evaluation Agency (IMEA) (Figure 2). Afterwards, the evaluation was conducted entirely in-house, with the methodology endorsed by the IMEA. It is worth noting that both IMEA and the consultants determined that the baseline scenario for the programs was static over the program life. All the changes in production were attributed to the DSM activities given the comprehensive nature of EGAT’s market interventions and the significance of their campaigns.

The World Bank (2006) published a post-implementation impact assessment report after the IMEA assessment and estimated the GHG reduction of the DSM again by constructing three scenarios: one with DSM scenario, two without DSM scenario with high and low baselines. Based on these estimates, the use of efficient lighting, refrigerators, and AC resulted in GHG emission reductions of approximately 20.9 megatons (Mt) in the period 1993-2004. Of this total, 12.6-17.4 Mt are attributable to DSM in 1993-2004. For crediting the outcome, one would need to come up with a concrete amount of emissions reductions and not a wide range of reductions.

[Insert Figure 2 here]

Energy efficiency program evaluation faces a trade-off between careful measurement and analysis on the one hand and simplicity and cost minimization on the other. After decades of experience, a wide range of evaluation techniques have been developed and refined to estimate energy savings with acceptable levels of precision (Figueres and Philips, 2007). On the other hand, it is not an easy task to accurately measure the energy savings resulting from energy efficiency policies and programs. Even in the Thai case, where the effect of the policy implementation was relatively clear, only a rough range of GHG emission reductions could be calculated.

4.2.3 Additionality

The investment analysis is usually not appropriate for energy efficiency policies to demonstrate additionality due to the fact that most efficiency improvements are in principle cost-effective and have relatively short pay-back periods. However, particularly in developing countries, efficiency increases often do not occur because of the lack of an enabling policy framework, the high initial capital cost, and the usual observed reluctance to base investment decisions on life-cycle cost analysis (Figueres and Philips, 2007). If households do not value electricity savings properly, in the case of expensive energy efficient appliances, the sale of emissions credits may be the only revenue source to the project implementer (Figueres and Bosi, 2006). There are also technology barriers which are probably more “appropriate” to demonstrate additionality of energy efficiency standards; they include limited access to energy efficiency technologies, lack of R&D and testing of energy efficient equipments etc. Or, one could build on the common practice analysis and use the market penetration approach as an alternative.

Related to this issue is consideration of the appropriate length of crediting period. The effect of an energy efficiency standard will entail several vintages of equipment and theoretically should last until the last vintage has reached the end of its technical lifetime. Again, the challenge is to derive the date at which the efficiency of the business-as-usual appliances would have reached the standard. The Thai case is a good example as FTL and refrigerators achieved a high market penetration in a quite short time period, but the FTL sales were lower than assumed mainly because of the financial crisis in 1997. If the policy is discontinued for a specific vintage of appliances, the average technical lifetime of that vintage determines the end of the crediting period. Generally, the crediting period should be determined through ex-post assessment of efficiency common practice of appliances in a country without an efficiency policy or the assessment whether certain technology penetration thresholds have been reached, as has been discussed in the FIT section.

3.2.4 Suitability of appliance efficiency standard for NAMA crediting

An appliance efficiency standard is relatively challenging as a credited NAMA because it requires a large volume of data that cannot easily be obtained. Moreover, additionality testing is problematic due to the fact that an investment test usually fails. So one has to resort to a barrier analysis which is more difficult to pass in a convincing manner. The duration of the crediting period would have to be determined by a common practice analysis or technology threshold assessment in a country with a similar level of development but lack of an energy efficiency policy. Altogether, efficiency standards would fit better into the category of supported NAMAs.

4. Conclusions

NAMA crediting has re-opened the discussion on offset crediting of policy-based mitigation actions in developing countries. Some policies allow to establish clear causality between the policy implementation and resulting emission reductions. For these cases, crediting may well be an option. The detailed analysis of a feed-in tariff and an efficiency standard has shown that the characteristics of a policy are crucial to determine whether crediting is possible. For the feed-in tariff, crediting seems relatively straightforward whereas for the efficiency standard, it is very challenging. In addition to the policy type, characteristics of countries and sectors also play an important role in determining whether the policies are "MRVable" and thus credibly creditable. These include availability of centralized, transparent data collection systems, an effective sector organization (e.g. no or a negligible number of informal actors) and feasibility of differentiating impacts of policies if there is an array of policies in place. Key challenges and possible solutions are summarized in Table 4.

[Insert Table 4 here]

The stringency level of MRV and additionality demonstration will be crucial for the credibility and political viability of a potential NAMA crediting mechanism. If there is a political consensus to achieve a high stringency level, only a small subset of policies in advanced, well governed developing countries remains available for crediting. If the stringency aimed for is lower, one will try to strike a balance between accuracy and complexity in the MRV and additionality approach. If the political aim is to allow a large number of developing countries to benefit from NAMA credits, policies would have to be covered whose greenhouse gas impacts can only be guessed. Here, environmental integrity might be sustained by using conservative default parameters for an estimate of emission reductions. Eventually it may be preferable not to grant credits for such policies and to finance them through subsidies instead.

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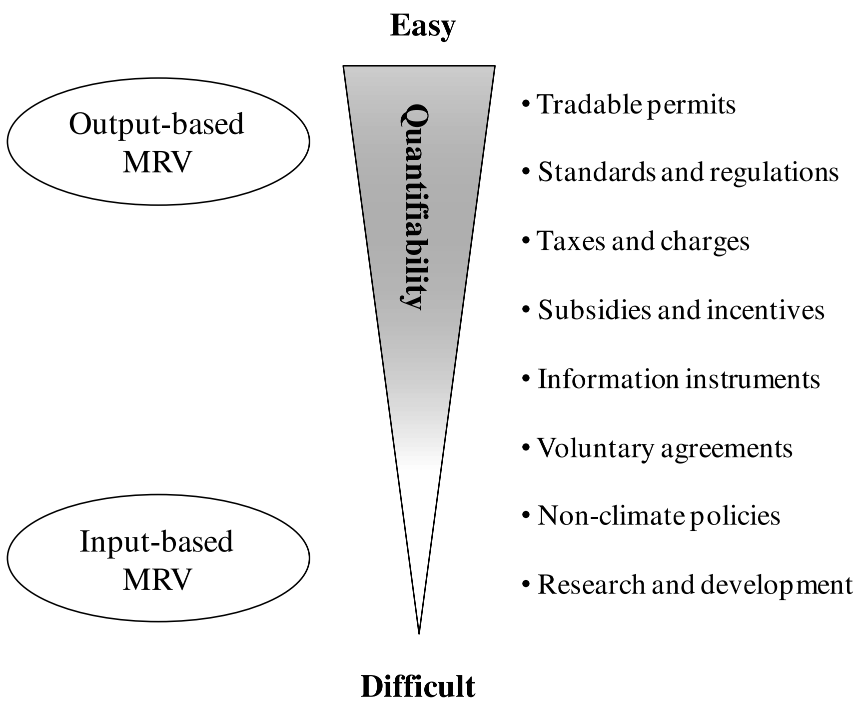

Figure 1 Quantifiability of policy impacts and suitable MRV schemes

Source: Authors

Note: The quantifiability of policy categories is only indicative.

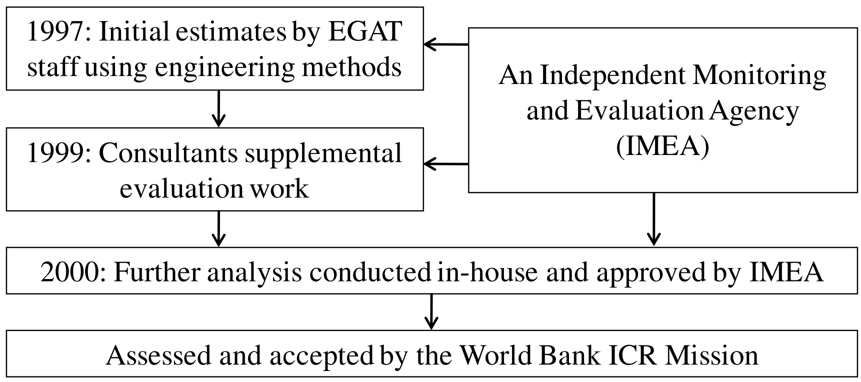

Figure 2 Verification steps of DSM program in Thailand

Source: Phumaraphad (2001).

List of Tables

Table 1 Feed-in tariff for renewable energy in Korea (Won/kWh)

PV	Wind	Small hydro	Biogas	Biomass
678-712	108	74	73-86	69

Source: Lee and Lee (2008).

Note: 1 € = 1,498 Won (15 June 2010).

Table 2 Comparison of unit cost of power generation in Korea (Won/kWh)

Nuclear	Coal (domestic)	Oil	LNG	PV	Wind
3.1	22.9 (60.5)	117.0	91.0	500-900	100-130

Source: Lee and Lee, 2008.

Note: 1 € = 1,498 Won (15 June 2010).

Table 3 DSM program for appliances in Thailand

<table>
<tr><th>Components</th><th>Main activities</th><th>Outcomes at project completion</th></tr>
<tr><td>Fluorescent tube lamps T12 to T8</td><td>Negotiate manufacturing & sales of quality-tested energy efficient T8 tubes</td><td>All manufactures switched production to T8; market transformation completed</td></tr>
<tr><td>Refrigerators</td><td rowspan="3">Promote energy-efficiency tested/labeled units using EGAT Label (#5 is the highest energy efficiency rating)</td><td>100% of domestically produced refrigerators and 82% of all refrigerators sold tested/labeled with EGAT Label #5</td></tr>
<tr><td>Air conditioners</td><td>EGAT Label #5 AC units accounted for nearly 40% the units sold</td></tr>
<tr><td>Compact fluorescent lamps</td><td>Large volume of units sold (900,000) at 40% below prevailing market price (that is, subsidized)</td></tr>
</table>

Source: World Bank (2006).

Table 4 Challenges of MRV and additionality requirements and possible solutions for policy NAMA

Issue	Challenges	Possible solutions
Measurement and additionality	Output data availability	• Capacity building at the institutional and governmental level • Incentives to reward high quality data collection • Protect confidentiality of data collected at a disaggregated level
	Methodology for emission reductions calculation	• Build on CDM methodologies where possible • Agree on degree of coverage of upstream/downstream emissions • Optimize mix of default parameters and monitoring to ensure sufficient causality and traceability
	Differentiation of impacts of each policy	• Allow crediting of a whole set of NAMAs where possible • Use appropriate conservativeness factor to cover changes in operating conditions
	Policy additionality	• Investment analysis or technology penetration analysis based on a predefined threshold
	Length of crediting period	• Make the length contingent on key variables, preferably using an investment test or common practice test for a similar country without a policy.
Reporting	Common format for NAMA comparison	• Build on reporting experience of the CDM
Verification	Transparency in the process	• Use independent third party as in the CDM
	Lack of capacity of auditors	• Training by UNFCCC • Subsidization of auditor courses in countries setting up NAMAs through fast-track finance
	Incentives to verify correctly	• Suspension of low-quality auditors • Hiring of auditors by UNFCCC

Source: Authors